## SEQUENCE LISTING

<110> Adney, William S. Decker, Stephen R. Lantz-McCarter, Suzanne Baker, John O. Vinzant, Todd B. Nieves, Rafael A. Himmel, Michael E. <120> CELLOBIOHYDROLASE REDUCED GLYCOSYLATION VARIANTS: CBHIN45A; CBHIN270A; AND CBHIN384A <130> HIMMEL NREL IR# 99-45 <140> <141> <160>4<170> PatentIn Ver. 2.0 <210>1 <211>496 <212> PRT <213> Trichoderma reesei <400>1Gln Ser Ala Cys Thr Leu Gln Ser Glu Thr His Pro Pro Leu Thr Trp 1 5 10 15 Gln Lys Cys Ser Ser Gly Gly Thr Cys Thr Gln Gln Thr Gly Ser Val 20 25 30 Val Ile Asp Ala Asn Trp Arg Trp Thr His Ala Thr Ala Ser Ser Thr 35 40 45 Asn Cys Tyr Asp Gly Asn Thr Trp Ser Ser Thr Leu Cys Pro Asp Asn 50 55 60 Glu Thr Cys Ala Lys Asn Cys Cys Leu Asp Gly Ala Ala Tyr Ala Ser 65 70 75 80

Thr Tyr Gly Val Thr Thr Ser Gly Asn Ser Leu Ser Ile Gly Phe Val 85 90 95

	Thr Gln Se		Lys Asn 105	Val Gly 11	_	Leu Tyr L	eu Met Ala
	Ser Asp Th	•	Gln Glu l 20	Phe Thr 125	Leu Leu	Gly Asn (	Glu Phe Ser
	Phe Asp V 130	al Asp Va 135	l Ser Gln	Leu Pro 140	Cys Gly	Leu Asn	Gly Ala Leu
	Tyr Phe Va	al Ser Met 150	-	Asp Gly 55	Gly Val 160	Ser Lys T	yr Pro Thr
		la Gly Ala 65	Lys Tyr (	Gly Thr	Gly Tyr ( 175	Cys Asp S	er Gln Cys
	Pro Arg As		Phe Ile A	Asn Gly 19		Asn Val C	ilu Gly Trp
	Glu Pro Se 195		Asn Ala . 00	Asn Thr 205	Gly Ile C	Gly Gly Hi	s Gly Ser
	Cys Cys Se 210	er Glu Met 215	Asp Ile	Ггр Glu 220	Ala Asn	Ser Ile Sei	Glu Ala
	Leu Thr Pr 225	o His Pro 230	-	Γhr Val ( 35	Gly Gln ( 240	Glu Ile Cy	s Glu Gly
-		ys Gly Gly 45	Thr Tyr 250	Ser Asp	Asn Arg 255	Tyr Gly (	Gly Thr Cys
	Asp Pro As 260		S Asp Trp 265		-	Leu Gly	Asn Thr Ser
	Phe Tyr Gl 275		Ser Ser P 80	he Thr I 285	.eu Asp∃	Γhr Thr Ly	ys Lys Leu
	Thr Val Va	l Thr Gln 295	Phe Glu	Thr Ser (	Gly Ala I	le Asn Ar	g Tyr Tyr
	Val Gln As 305	sn Gly Val 310		Gln Gln 15	Pro Asn 320	Ala Glu I	æu Gly Ser
	-	y Asn Glu 25	Leu Asn 330	• •	Tyr Cys 335	Thr Ala (	Glu Glu Ala

		,		
Glu Phe Gly 0 340	Gly Ser Ser Ph 345	e Ser Asp 35	Lys Gly Gly Lei 0	a Thr Gln Phe
Lys Lys Ala 7 355	Γhr Ser Gly Gl 360	y Met Val 365	Leu Val Met Se	r Leu Trp Asp
Asp Tyr Tyr 2	Ala Asn Met L 375	eu Trp Let 380	ı Asp Ser Thr T	yr Pro Thr Asn
Glu Thr Ser S 385	Ser Thr Pro Gly 390	y Ala Val A 395	Arg Gly Ser Cys 400	Ser Thr Ser
Ser Gly Val F 405			Gln Ser Pro Asn 415	Ala Lys Val
Thr Phe Ser A	Asn Ile Lys Phe 425	e Gly Pro I 43	le Gly Ser Thr C 0	Gly Asn Pro
Ser Gly Gly A 435	Asn Pro Pro Gl 440	y Gly Asn 445	Arg Gly Thr Th	r Thr Thr Arg
Arg Pro Ala 7 450	Γhr Thr Thr Gl 455	y Ser Ser F 460	Pro Gly Pro Thr	Gln Ser His
Tyr Gly Gln ( 465	Cys Gly Gly Ile 470	e Gly Tyr S 475	Ser Gly Pro Thr 480	Val Cys Ala
Ser Gly Thr T 485	-		Pro Tyr Tyr Sei 495	Gln Cys Leu
<210> 2 <211> 496 <212> PRT <213> Tricho	oderma reesei			
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Gln Lys Cys S 20	Ser Ser Gly Gl 25	y Thr Cys '	Thr Gln Gln Th	r Gly Ser Val
Val Ile Asp A	da Asn Trp Ar	g Trp Thr l	His Ala Thr Asr	Ser Ser Thr

- $\begin{array}{ccc} \text{Asn Cys Tyr Asp Gly Asn Thr Trp Ser Ser Thr Leu Cys Pro Asp Asn} \\ 50 & 55 & 60 \end{array}$
- Glu Thr Cys Ala Lys Asn Cys Cys Leu Asp Gly Ala Ala Tyr Ala Ser 65 70 75 80
- Thr Tyr Gly Val Thr Thr Ser Gly Asn Ser Leu Ser Ile Gly Phe Val 85 90 95
- Thr Gln Ser Ala Gln Lys Asn Val Gly Ala Arg Leu Tyr Leu Met Ala 100 105 110
- Ser Asp Thr Thr Tyr Gln Glu Phe Thr Leu Leu Gly Asn Glu Phe Ser 115 120 125
- Phe Asp Val Asp Val Ser Gln Leu Pro Cys Gly Leu Asn Gly Ala Leu 130 135 140
- Tyr Phe Val Ser Met Asp Ala Asp Gly Gly Val Ser Lys Tyr Pro Thr 145 150 155 160
- Asn Thr Ala Gly Ala Lys Tyr Gly Thr Gly Tyr Cys Asp Ser Gln Cys 165 170 175
- Pro Arg Asp Leu Lys Phe Ile Asn Gly Gln Ala Asn Val Glu Gly Trp 180 185 190
- Glu Pro Ser Ser Asn Asn Ala Asn Thr Gly Ile Gly Gly His Gly Ser 195 200 205
- Cys Cys Ser Glu Met Asp Ile Trp Glu Ala Asn Ser Ile Ser Glu Ala 210 215 220
- Leu Thr Pro His Pro Cys Thr Thr Val Gly Gln Glu Ile Cys Glu Gly 225 230 235 240
- Asp Gly Cys Gly Gly Thr Tyr Ser Asp Asn Arg Tyr Gly Gly Thr Cys 245 250 255
- Asp Pro Asp Gly Cys Asp Trp Asn Pro Tyr Arg Leu Gly Ala Thr Ser 260 265 270
- Phe Tyr Gly Pro Gly Ser Ser Phe Thr Leu Asp Thr Thr Lys Lys Leu

Thr Val Val Thr Gln Phe Glu Thr Ser Gly Ala Ile Asn Arg Tyr Tyr 290 295 300

Val Gln Asn Gly Val Thr Phe Gln Gln Pro Asn Ala Glu Leu Gly Ser 305 310 315 320

Tyr Ser Gly Asn Glu Leu Asn Asp Asp Tyr Cys Thr Ala Glu Glu Ala 325 330 335

Glu Phe Gly Gly Ser Ser Phe Ser Asp Lys Gly Gly Leu Thr Gln Phe 340 345 350

Lys Lys Ala Thr Ser Gly Gly Met Val Leu Val Met Ser Leu Trp Asp 355 360 365

Asp Tyr Tyr Ala Asn Met Leu Trp Leu Asp Ser Thr Tyr Pro Thr Asn 370 375 380

Glu Thr Ser Ser Thr Pro Gly Ala Val Arg Gly Ser Cys Ser Thr Ser 385 390 395 400

Ser Gly Val Pro Ala Gln Val Glu Ser Gln Ser Pro Asn Ala Lys Val 405 410 415

Thr Phe Ser Asn Ile Lys Phe Gly Pro Ile Gly Ser Thr Gly Asn Pro 420 425 430

Ser Gly Gly Asn Pro Pro Gly Gly Asn Arg Gly Thr Thr Thr Thr Arg
435 440 445

Arg Pro Ala Thr Thr Gly Ser Ser Pro Gly Pro Thr Gln Ser His 450 455 460

Tyr Gly Gln Cys Gly Gly Ile Gly Tyr Ser Gly Pro Thr Val Cys Ala 465 470 475 480

Ser Gly Thr Thr Cys Gln Val Leu Asn Pro Tyr Tyr Ser Gln Cys Leu 485 490 495

<210>3

<211>496

<212> PRT

## <213> Trichoderma reesei

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Val Ile Asp Ala Asn Trp Arg Trp Thr His Ala Thr Asn Ser Ser Thr 35 40 45

Asn Cys Tyr Asp Gly Asn Thr Trp Ser Ser Thr Leu Cys Pro Asp Asn 50 55 60

Glu Thr Cys Ala Lys Asn Cys Cys Leu Asp Gly Ala Ala Tyr Ala Ser 65 70 75 80

Thr Tyr Gly Val Thr Thr Ser Gly Asn Ser Leu Ser Ile Gly Phe Val 85 90 95

Thr Gln Ser Ala Gln Lys Asn Val Gly Ala Arg Leu Tyr Leu Met Ala 100 105 110

Ser Asp Thr Thr Tyr Gln Glu Phe Thr Leu Leu Gly Asn Glu Phe Ser 115 120 125

Phe Asp Val Asp Val Ser Gln Leu Pro Cys Gly Leu Asn Gly Ala Leu 130 135 140

Tyr Phe Val Ser Met Asp Ala Asp Gly Gly Val Ser Lys Tyr Pro Thr 145 150 155 160

Asn Thr Ala Gly Ala Lys Tyr Gly Thr Gly Tyr Cys Asp Ser Gln Cys 165 170 175

Pro Arg Asp Leu Lys Phe Ile Asn Gly Gln Ala Asn Val Glu Gly Trp 180 185 190

Glu Pro Ser Ser Asn Asn Ala Asn Thr Gly Ile Gly Gly His Gly Ser 195 200 205

Cys Cys Ser Glu Met Asp Ile Trp Glu Ala Asn Ser Ile Ser Glu Ala 210 215 220

225	Inr Pro	230	,	thr Val C 35	240 240	iu He Cy	s Glu Gly	<b>∮</b>	
Asp	Gly Cys 24.		Thr Tyr 250	-	Asn Arg T 255	Γyr Gly (	Gly Thr C	Cys	
Asp l	Pro Asp 260	Gly Cys	s Asp Trp 265	Asn Pro 270	Tyr Arg I )	Leu Gly	Asn Thr	Ser	
	Гуг Gly 275	_	Ser Ser P 80	the Thr L 285	eu Asp Th	ır Thr L	ys Lys Le	u	
Thr V 29		Thr Gln 295	Phe Glu	Thr Ser C 300	Gly Ala Ile	e Asn Ar	g Tyr Tyi	r	
Val ( 305	Gln Asn	Gly Val 310		Gln Gln 15	Pro Asn A	Ala Glu I	æu Gly S	Ser	
Tyr S	Ser Gly . 32.		Leu Asn 330		Tyr Cys 7 335	Γhr Ala (	Glu Glu A	Ala	
Glu I	Phe Gly 340	Gly Ser	Ser Phe S 345	Ser Asp L 350	.ys Gly Gl )	ly Leu T	hr Gln Ph	ne	
•	Lys Ala 355		Gly Gly N 60	Met Val L 365	æu Val M	let Ser L	eu Trp A	sp	
Asp '		Ala Asn 375	Met Leu	Trp Leu 380	Asp Ser 7	Thr Tyr <b>I</b>	Pro Thr A	Ma	
Glu 7 385	Γhr Ser	Ser Thr I	-	da Val A 95	rg Gly Se 400	r Cys Se	r Thr Ser		
Ser C	Gly Val 1 40:		Gln Val C 410		ln Ser Pro 115	Asn Al	a Lys Va	1	
Thr F	Phe Ser . 420	Asn Ile I	Lys Phe G 425	ily Pro Ile 430	e Gly Ser´	Thr Gly	Asn Pro		
	Gly Gly 435		Pro Gly 0 10	Gly Asn A 445	Arg Gly T	hr Thr T	hr Thr Ai	rg	
Arg I 45		Thr Thr 455	Thr Gly S	Ser Ser Pi 460	ro Gly Pro	Thr Gli	n Ser His		

Tyr Gly Gln Cys Gly Gly Ile Gly Tyr Ser Gly Pro Thr Val Cys Ala Ser Gly Thr Thr Cys Gln Val Leu Asn Pro Tyr Tyr Ser Gln Cys Leu <210>4 <211>496 <212> PRT <213> Trichoderma reesei <400>4 Gln Ser Ala Cys Thr Leu Gln Ser Glu Thr His Pro Pro Leu Thr Trp Gln Lys Cys Ser Ser Gly Gly Thr Cys Thr Gln Gln Thr Gly Ser Val Val Ile Asp Ala Asn Trp Arg Trp Thr His Ala Thr Asn Ser Ser Thr Asn Cys Tyr Asp Gly Asn Thr Trp Ser Ser Thr Leu Cys Pro Asp Asn Glu Thr Cys Ala Lys Asn Cys Cys Leu Asp Gly Ala Ala Tyr Ala Ser Thr Tyr Gly Val Thr Thr Ser Gly Asn Ser Leu Ser Ile Gly Phe Val Thr Gln Ser Ala Gln Lys Asn Val Gly Ala Arg Leu Tyr Leu Met Ala Ser Asp Thr Thr Tyr Gln Glu Phe Thr Leu Leu Gly Asn Glu Phe Ser Phe Asp Val Asp Val Ser Gln Leu Pro Cys Gly Leu Asn Gly Ala Leu Tyr Phe Val Ser Met Asp Ala Asp Gly Gly Val Ser Lys Tyr Pro Thr Asn Thr Ala Gly Ala Lys Tyr Gly Thr Gly Tyr Cys Asp Ser Gln Cys 

Ser Glu M 21 Pro His Pr 230 Cys Gly G 245 Asp Gly C 0	fet Asp IIe 15 To Cys Thr 2 Gly Thr Tyr 250 ys Asp Trp 265 y Ser Ser P	Trp Glo 220 Thr Val 35 Ser As Asn Pr	5 u Ala A l Gly Gl 24 p Asn A 255 ro Tyr A 70	sn Ser I In Glu II 40 Arg Tyr (	Gly His Gly Sile Ser Glu Alle Cys Glu CGly Gly Thr
Pro His Pr 230 Cys Gly G 245 Asp Gly C 0 Gly Pro Gly al Thr Glr	o Cys Thr 7 2 Sly Thr Tyr 250  ys Asp Trp 265  y Ser Ser P	220 Thr Val 35 Ser As Asn Pr 2	I Gly Gl 24 p Asn A 255 ro Tyr A 70	In Glu II 40 Arg Tyr ( Arg Leu	le Cys Glu C Gly Gly Thr Gly Asn Th
230 Cys Gly G 245 Asp Gly C O Gly Pro Gly al Thr Glr	Ily Thr Tyr 250 ys Asp Trp 265 y Ser Ser P	Ser As Asn Pr 2	24 p Asn A 255 ro Tyr A 70	40 Arg Tyr ( Arg Leu	Gly Gly Thr Gly Asn Th
Asp Gly C 0 Gly Pro Gly al Thr Glr	ys Asp Trp 265 y Ser Ser P 280	Asn Pr 2 the Thr	255 ro Tyr <i>A</i> 70	Arg Leu	Gly Asn Th
lly Pro Gl	y Ser Ser P 280	2 he Thr	70		
al Thr Glr	280	he Thr 285	Leu Ası	CEN CON	
al Thr Glr			•	p Thr Ti	hr Lys Lys L
493	n Phe Glu 7 5	Γhr Ser 300	Gly Ala	a Ile Ası	n Arg Tyr T
sn Gly Va 310	al Thr Phe (	Gln Gln 5	Pro As	sn Ala G 0	Glu Leu Gly
y Asn Glu 325	Leu Asn A	Asp As <sub>l</sub>	p Tyr C <sub>2</sub> 335	ys Thr A	Ala Glu Glu
y Gly Ser	Ser Phe Se	er Asp 1	Lys Gly 0	Gly Le	u Thr Gln P
a Thr Ser	Gly Gly M 60	et Val I 365	Leu Val	Met Se	er Leu Trp A
r Ala Asn 375	Met Leu T	Trp Leu 380	Asp Se	r Thr Ty	yr Pro Thr A
Ser Thr I	Pro Gly Ala 395	a Val A	rg Gly S 400	Ser Cys	Ser Thr Ser
270		u Ser G	ln Ser P	ro Asn	Ala Lys Val
	Ser Thr I	Ser Thr Pro Gly Ala 390 395 Pro Ala Gln Val Gli	Ser Thr Pro Gly Ala Val A 390 395 Pro Ala Gln Val Glu Ser G	Ser Thr Pro Gly Ala Val Arg Gly S 390 395 400 Pro Ala Gln Val Glu Ser Gln Ser P	Ser Thr Pro Gly Ala Val Arg Gly Ser Cys

•

Thr Phe Ser Asn Ile Lys Phe Gly Pro Ile Gly Ser Thr Gly Asn Pro 420 425 430

Ser Gly Gly Asn Pro Pro Gly Gly Asn Arg Gly Thr Thr Thr Thr Arg 435 440 445

Arg Pro Ala Thr Thr Gly Ser Ser Pro Gly Pro Thr Gln Ser His 450 455 460

Tyr Gly Gln Cys Gly Gly Ile Gly Tyr Ser Gly Pro Thr Val Cys Ala 465 470 475 480

Ser Gly Thr Thr Cys Gln Val Leu Asn Pro Tyr Tyr Ser Gln Cys Leu 485 490 495